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(54) Title: METHOD OF MAKING A COMPOSITE PANEL

(57) Abstract: A method of making a composite panel from two substantially similar panel skins (40, 42) and an edging (48), is disclosed. The first panel skin (40), is made in a mould from a first composition comprising a thermosetting resin, a catalyst for the thermosetting resin and inorganic filler particles. On this layer is placed a layer of a fibrous reinforcing material wetted with a second composition comprising a thermosetting resin and a catalyst for the thermosetting resin. Before the thermosetting resin in the second

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METHOD OF MAKING A COMPOSITE PANEL

BACKGROUND OF THE INVENTION

THIS invention relates to a method of making a composite panel from two substantially similar panel skins, and to the composite panel so made.

SUMMARY OF THE INVENTION

According to a first aspect of the invention there is provided a method of making a composite panel from two substantially similar panel skins and an edging, each panel skin being made in a mould, including the steps of:

(1) forming a first panel skin by:

(a) applying a layer of a first composition comprising a thermosetting resin, a catalyst for the thermosetting resin and inorganic filler particles, to a surface of a first mould;

(b) allowing the thermosetting resin to set to form an outer face of the first panel skin;

(c) forming a layer of a fibrous reinforcing material wetted with a second composition comprising a thermosetting resin and a catalyst for the thermosetting resin on the product of step (1)(b);

(2) before the thermosetting resin in the second composition has set, placing an edging all around the edge of the product of step (1)(c);

(3) allowing the thermosetting resin in the second composition to set to form a combination of the first panel skin with the edging attached thereto, and optionally removing the combination from the first mould;

(4) forming a second panel skin by:

(a) applying a layer of the first composition to a surface of a second mould which is substantially similar to the first mould;

(b) allowing the thermosetting resin to set to form an outer face of the second panel skin;

(c) forming a layer of a fibrous reinforcing material wetted with the second composition on the product of step (4)(b);

either

(5) before the thermosetting resin in the second composition has set, placing an edging all around the edge of the product of step (4)(c);

(6) allowing the thermosetting resin to set to form a combination of the second panel skin with the edging attached thereto, and removing the combination from the mould; and

(7) applying an adhesive composition to the edgings of the two combinations and joining the edgings of the two combinations to each other to form an intermediate panel including a cavity defined by the first and second panel skins separated by the edgings;

or

(8) before the thermosetting resin in the second composition has set, placing the combination of step (3) on the product of step (4)(c) with the edging in contact with the product of step (4)(c);

(9) allowing the thermosetting resin to set to form an intermediate panel from the second panel skin and the combination, the intermediate panel

including a cavity defined by the first and second panel skins separated by the edging;

(10) removing the intermediate panel from the mould or moulds;

and

(11) after step (7) or step (10) filling the cavity with a polyurethane foam to form the composite panel.

The method of the invention preferably includes the additional steps of:
between steps (1)(b) and (1)(c) and/or between steps (4)(b) and (4)(c), applying a layer of a third connecting composition comprising a thermosetting resin and a catalyst for the thermosetting resin to the product of step (1)(b) or the product of step (4)(b);

between steps (6) and (7) removing any excess material from the two combinations so that the two combinations are of substantially similar size and of the desired thickness;

if the edging or edgings do not include one or more holes therethrough, between steps (7) and (11) or between steps (10) and (11) forming one or more holes in the edging or edgings to allow access to the cavity in the intermediate panel;

after step (11) applying a decorative coating and/or a sealant coating to one or both outer faces of the first and second panel skins of the composite panel.

According to a second aspect of the invention there is provided a composite panel made by the method described above.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a plan view of a combination of a first panel skin with an edging attached thereto for use in a first aspect of the method of the invention;

Figure 2 is a sectioned side view of the combination of Figure 1, together with an identical combination;

Figure 3 is a sectioned side view of a composite panel of the invention formed from the combinations of Figure 2;

Figure 4 is a sectioned side view of a combination of a first panel skin with an edging attached thereto for use in a second aspect of the method of the invention;

Figure 5 is a sectioned side view of the combination of Figure 4, together with a second panel skin; and

Figure 6 is a sectioned side view of a composite panel of the invention formed from the combination and second panel skin of Figure 5.

DESCRIPTION OF EMBODIMENTS

The crux of the invention is a method of making a composite panel from two substantially similar panel skins and an edging or edgings, wherein each panel skin is made in a mould.

Each mould is preferably made of a silicon rubber. Further, each mould preferably replicates the surface of a natural wood or other natural material, so that the composite panel made using the mould, replicates the appearance of the natural wood or other natural material.

The first step of the method of the invention is to form a first panel skin in a first mould by applying a layer of a first composition to a surface of the mould.

The first composition comprises a thermosetting resin, a catalyst for the thermosetting resin, and inorganic filler particles.

The thermosetting resin in the first composition, as well as in the second and third compositions, is preferably chosen from the group consisting of isophthalic or orthophthalic unsaturated polyester resins and phenol formaldehyde resole resins.

The thermosetting resins in the first, second and third compositions do not need to be the same thermosetting resin.

An example of a suitable phenol formaldehyde resole resin is J2018L by Borden Chemical Company, typically catalysed at between 6% to 10% with an acid catalyst such Phencat 10.

When the thermosetting resin is an unsaturated polyester resin, it is preferred that an orthophthalic unsaturated polyester resin is used for composite panels intended for interior use, and that an isophthalic unsaturated polyester resin, preferably a neopentol glycol modified resin, is used for composite panels intended for exterior use. Examples of these resins are those manufactured by Scott Bader including Crystic 272. These resins are preferably pre-accelerated with accelerators such as a cobalt octoate or a naphthenate catalysed with an organic peroxide, such as methyl ethyl ketone peroxide.

The inorganic filler particles may be any suitable inorganic filler particles such as for example barium sulphate, or a combination of barium sulphate with calcium carbonate, the particles preferably having a particle size of from 10 to 20 micron inclusive.

The first composition preferably includes from 50% to 150% inclusive by mass of the thermosetting resin of the inorganic filler particles.

The first composition may also include a pigment so that the outer face of the composite panel is coloured.

The first composition is preferably applied to the mould by means of spraying or by means of brushing.

Preferably, a uniform thickness layer is applied, at a thickness of from 100 to 1000 micron inclusive.

After the first composition has been applied to the surface of the mould, the thermosetting resin is allowed to set to form an outer face of the first panel skin.

The next optional step of the method of the invention is to apply a layer of a third connecting composition comprising a thermosetting resin and a catalyst therefor, to the product of step (1)(b).

The thermosetting resin in the third composition may be any of those named above.

The next step of the method of the invention is to form a layer of a fibrous reinforcing material, wetted with a second composition comprising a thermosetting resin and a catalyst therefor, onto the product of step (1)(b) or the product of the optional step above.

The fibrous reinforcing material is preferably fibreglass, either in the form of chopped strand mat at weights of 300 kg/m^2 to 450 kg/m^2 or chopped strand applied by means of a chopper gun with a concurrent catalysed resin spray.

The thermosetting resin with which the fibrous reinforcing material is wetted may be any of those named above.

Where a build is required over a steep mould surface or indentation, to prevent resin slump and to provide adequate reinforcement and prevention of air bubbles, the thermosetting resin may be thickened with a suitable thickener such as micronised silica, e.g Aerosil by Degussa, added to the resin in an amount of from 15 to 60 g/600 g of resin.

The layer of fibrous reinforcing material wetted with the thermosetting resin and catalyst therefor preferably has a thickness of from 0,2 mm to 2,5 mm inclusive.

The next step of the method of the invention is carried out before the thermosetting resins in the second composition and third composition (where present) have set, and involves placing an edging all around the edge of the product of step (1)(c). It is important that the edging is placed in position before the setting of the thermosetting resins, in order to ensure intimate contact between the edging and the product of step (1)(c), and to ensure uniform thickness of the product of step (1)(c) below the edging.

The edging is preferably formed from a plurality of lengths of wood or other suitable lignocellulosic material. The edging may also be a suitably profiled sheet metal edging.

Where a single edging is used, the edging preferably has a width or thickness of from 24 mm to 100 mm inclusive. Where two edgings are used, the edgings preferably each have a width or thickness of from 12 mm to 50 mm inclusive. In other words the spacing between the first and second panel skins is preferably from 24 mm to 100 mm inclusive.

When lengths of wood or other lignocellulosic material are used to form the edging, once the composite panel is complete, the edging is able to accommodate hinges, handles and other hardware, so that the composite

panel may be used for the construction of a door or the like. A suitable material for the construction of the edging is pine or the like.

The next step of the method of the invention is to allow the thermosetting resin to set to form a combination of the first panel skin with the edging attached thereto. At this stage, the combination may optionally be removed from the first mould.

The next step of the method of the invention is to form a second panel skin in a second mould which is substantially similar to the first mould. In fact, the first mould may be used as the second mould, or two substantially similar moulds may be used as the first and second moulds.

The second panel skin is made in the same manner and from the same compositions as the first panel skin, i.e steps (1)(a) to (c) are repeated as steps (4)(a) to (c).

There are now two ways to proceed.

Firstly, before the thermosetting resins in the second composition and third composition (where present) have set, an edging is placed all around the edge of the product of step (4)(c). Again it is important that the edging is placed in position before the setting of the thermosetting resins, in order to ensure intimate contact between the edging and the product of step (4)(c), and to ensure uniform thickness of the product of step (4)(c) below the edging.

The edging may be as described above.

The next step is to allow the thermosetting resin to set to form a combination of the second panel skin with the edging attached thereto. At this stage the combination is removed from the mould.

The next optional step of the method of the invention is to remove any excess material from the two combinations so that the two combinations are of substantially similar size and of the desired thickness. This may be achieved for example by passing each combination through a sander, so that the edgings, in combination with the panel skins, are dimensioned to their exact required thickness.

The surfaces of the edgings which are not adhesively secured to one another in formation of the composite panel, may be laminated with a material that simulates the appearance of the outer faces of the composite panel.

The next step of the method of the invention is to apply an adhesive composition to the edgings of the two combinations to join the edgings of the two combinations to each other to form an intermediate panel, including a cavity defined by the adhesively joined edgings.

The adhesive composition may comprise polyvinyl acetate or an acrylic dispersion in water, optionally containing up to 20% by mass of a water dispersible MDI, which is a urethane prepolymer, i.e. Duthane 1042 by Industrial Urethanes of South Africa.

This step is preferably carried out in a press to ensure good adhesion of the two combinations to each other.

Secondly and in the alternative, before the thermosetting resin has set, the combination of step (3) may be placed on the product of step (4)(c), with the edging in contact with the product of step (4)(c). Again it is important that the edging is placed in position before the setting of the thermosetting resin, in order to ensure intimate contact between the edging and the product of step (4)(c), and to ensure uniform thickness of the product of step (4)(c) below the edging.

The next step of the method of the invention is to allow the thermosetting resin to set to form an intermediate panel from the second panel skin and the combination, the intermediate panel including a cavity defined by the first and second panel skins and the edging.

The next step of the method of the invention is to remove the intermediate panel from the second mould (and from the first mould, if necessary).

If the edging or edgings do not include one or more holes therethrough, formed during manufacture of the edgings for example, then, between steps (7) and (11), or between steps (10) and (11) there is included the step of forming one or more holes in the edgings to allow access to the cavity in the intermediate panel. For example, holes may be drilled in one end of the intermediate panel through the edging, through which the polyurethane foam may be introduced, and holes may be drilled in the other end of the intermediate panel, to allow for the egress of air from the cavity.

The next step of the method of the invention is to fill the cavity with a polyurethane foam to form the composite product.

For example, the polyurethane foam may be injected into the cavity through the hole or holes to fill the cavity at a density of from 25 kg/m^3 to 100 kg/m^3 inclusive.

The polyurethane foam may be any suitable polyurethane foam, such as for example 100 parts by mass of a fire retardant polyol, Duthane 0514, to 120 parts by mass of Duthane 5005, both by Industrial Urethanes of South Africa, to give an in situ foam mass with a density of 40 kg/m^3.

The polyurethane foam serves the function of stiffening the composite panel. It adheres firmly to the two panel skins, it provides thermal insulation and maintains the two panel skins in parallel.

The step of filling the cavity of the intermediate panel with polyurethane foam is preferably carried out with the intermediate panel in a press to restrain both panel skins of the intermediate panel.

Thereafter, the composite panel may be trimmed to the size required.

The method of the invention also includes the optional step of applying to the outer faces of the composite panel a decorative coating, such as for example a pigment in an oil, the coating being applied by means of a spray gun or the like. For example, when a decorative coating comprising a pigment in an oil is used, this is applied as a wash coat which is worked into the surface of the outer faces. This is then allowed to dry, after which the oil binds the pigment to the surface of the outer faces.

Thereafter, or as an alternative, there may be applied to the outer faces of the composite panel a sealant coating such as for example an acrylic or a polyurethane.

The advantages of the method of the invention are that two substantially identical panel skins are used to form a composite panel which results in the fact that any stresses in one panel skin are perfectly balanced by those in the other panel skin, thus providing the composite panel with strength and dimensional stability.

The method of the invention will now be described with reference to the accompanying drawings.

Referring to Figure 1 to 3, there is shown two combinations 10, 12 each consisting of a panel skin comprising an outer face 14 formed from a first composition as described above and a layer 16 of a fibrous reinforcing material adhered to the outer face 14 as described above, and an edging 18 formed from lengths of pine.

When the two combinations 10, 12 have been made by the method of the invention, the edgings 18 are adhered to each other with a suitable adhesive composition, to form an intermediate panel containing a cavity defined by the edgings 18. This cavity is then filled with a polyurethane foam 20 to form the composite panel of the invention.

Referring to Figures 4 to 6, there is shown first and second panel skins 40, 42 each consisting of an outer face 44 formed from a first composition as described above, and a layer 46 of a fibrous reinforcing material adhered to the outer face 44 as described above.

An edging 48 formed from length of pine is located between the two panel skins 40, 42.

The panel skin 40 is first made by the method described above, whereafter the edging 48 is attached thereto. Thereafter the second panel skin 42 is made by the method described above and the combination of the first panel skin 40 and edging 48 is then adhered thereto as described above. There is thus formed an intermediate panel containing a cavity defined by the first and second panel skins 40, 42 and the edging 48. This cavity is then filled with a polyurethane foam 50 to form the composite panel of the invention.

CLAIMS

1 A method of making a composite panel from two substantially similar panel skins and an edging, each panel skin being made in a mould, including the steps of:

(1) forming a first panel skin by:

(a) applying a layer of a first composition comprising a thermosetting resin, a catalyst for the thermosetting resin and inorganic filler particles, to a surface of a first mould;

(b) allowing the thermosetting resin to set to form an outer face of the first panel skin;

(c) forming a layer of a fibrous reinforcing material wetted with a second composition comprising a thermosetting resin and a catalyst for the thermosetting resin on the product of step (1)(b);

(2) before the thermosetting resin in the second composition has set, placing an edging all around the edge of the product of step (1)(c);

(3) allowing the thermosetting resin in the second composition to set to form a combination of the first panel skin with the edging attached thereto, and optionally removing the combination from the first mould;

(4) forming a second panel skin by:

(a) applying a layer of the first composition to a surface of a second mould which is substantially similar to the first mould;

(b) allowing the thermosetting resin to set to form an outer face of the second panel skin;

(c) forming a layer of a fibrous reinforcing material wetted with the second composition on the product of step (4)(b);

<u>either</u>

(5) before the thermosetting resin in the second composition has set, placing an edging all around the edge of the product of step (4)(c);

(6) allowing the thermosetting resin to set to form a combination of the second panel skin with the edging attached thereto, and removing the combination from the mould; and

(7) applying an adhesive composition to the edgings of the two combinations and joining the edgings of the two combinations to each other to form an intermediate panel including a cavity defined by the first and second panel skins separated by the edgings;

or

(8) before the thermosetting resin in the second composition has set, placing the combination of step (3) on the product of step (4)(c) with the edging in contact with the product of step (4)(c);

(9) allowing the thermosetting resin to set to form an intermediate panel from the second panel skin and the combination, the intermediate panel including a cavity defined by the first and second panel skins separated by the edging;

(10) removing the intermediate panel from the mould or moulds;

and

(11) after step (7) or step (10) filling the cavity with a polyurethane foam to form the composite panel.

2 A method according to claim 1 including the step, between steps (1)(b) and (1)(c) and/or between steps (4)(b) and (4)(c), of applying a layer of a third connecting composition comprising a thermosetting resin and a catalyst for the thermosetting resin to the product of step (1)(b) or the product of step (4)(b).

3 A method according to claim 1 or claim 2 including the step, between steps (6) and (7), of removing any excess material from the two combinations so that the two combinations are of substantially similar size and of a desired thickness.

4 A method according to any one of claims 1 to 3 including the step, between steps (7) and (11) or between steps (10) and (11), of forming one or more holes in the edging or edgings to allow access to the cavity in the intermediate panel.

5 A method according to any one of claims 1 to 4 including the step, after step (11), of applying a decorative coating or a sealant coating to one or both outer faces of the first and second panel skins of the composite panel.

6 A method according to any one of claims 1 to 5 wherein the thermosetting resin in the first composition, the second composition and the third composition if present, is selected from the group consisting of isophthalic unsaturated polyester resins, orthophthalic unsaturated polyester resins, and phenol formaldehyde resole resins.

7 A method according to any one of claims 1 to 6 wherein the inorganic filler particles in the first composition are selected from the group consisting of barium sulphate and a combination of barium sulphate and calcium carbonate, the particles having a particle size of from 10 to 20 micron inclusive.

8 A method according to any one of claims 1 to 7 wherein the first composition includes from 50% to 150% inclusive by mass of the thermosetting resin of the inorganic filler particles.

9 A method according to any one of claims 1 to 8 wherein in step (1)(a) and step (4)(a) the layer has a thickness of from 100 to 1 000 micron inclusive.

10 A method according to any one of claims 1 to 9 wherein in step (1)(c) and step (4)(c) the fibrous reinforcing material is fibreglass.

11 A method according to any one of claims 1 to 10 wherein in step (1)(c) and in step (4)(c) the layer has a thickness of from 0,2 mm to 2,5 mm inclusive.

12 A method according to any one of claims 1 to 11 wherein the edging or edgings are formed from a plurality of lengths of wood or a plurality of lengths of a sheet metal.

13 A method according to any one of claims 1 to 12 wherein when a single edging is used the edging has a width of from 24 mm to 100 mm inclusive and when two edgings are used, the edgings each have a width of from 12 mm to 50 mm inclusive.

14 A method according to any one of claims 1 to 13 wherein in step (11) the cavity is filled with a polyurethane foam at a density of from 25 kg/m^3 to 100 kg/m^3 inclusive.

Fig 1

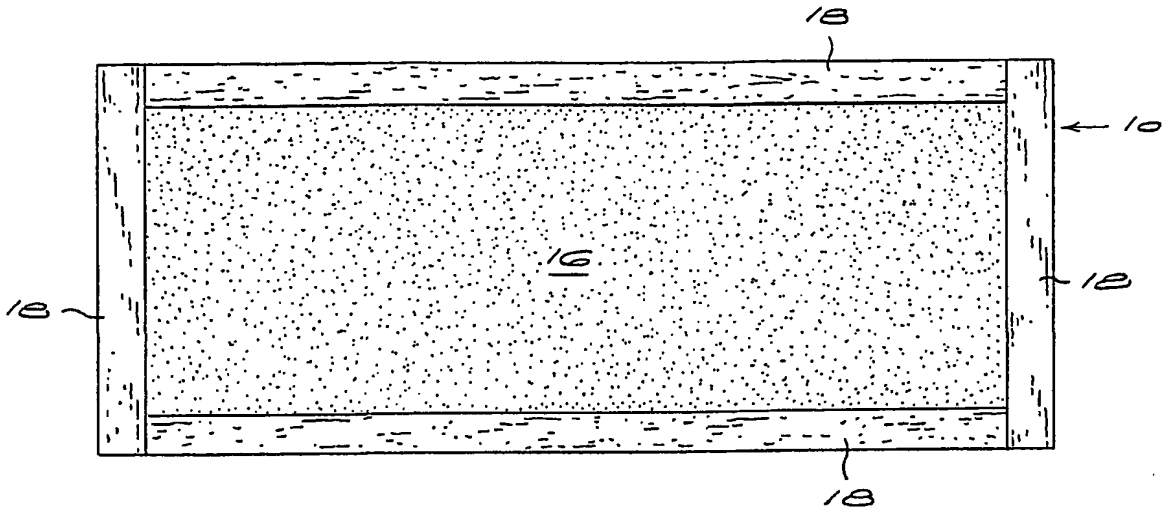


Fig 2

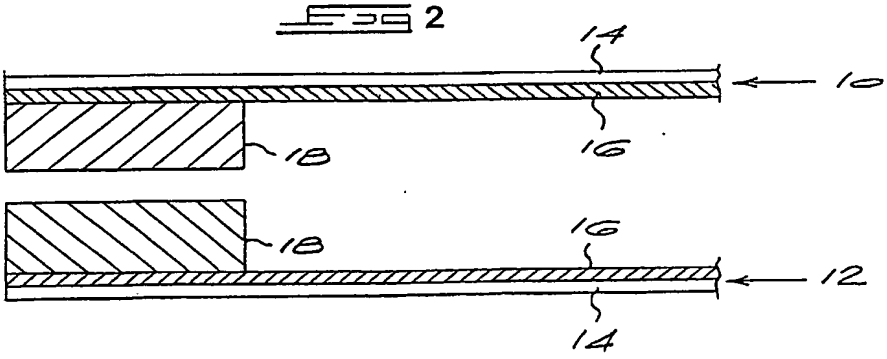


Fig 3

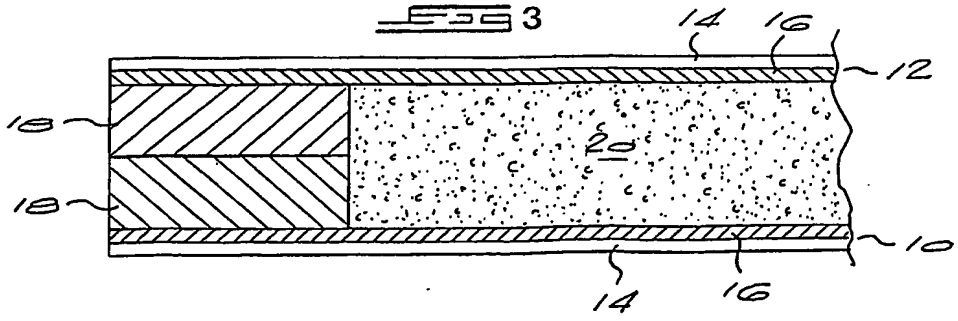


Fig 4

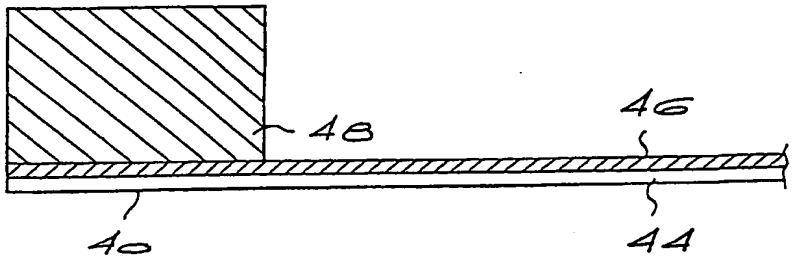


Fig 5

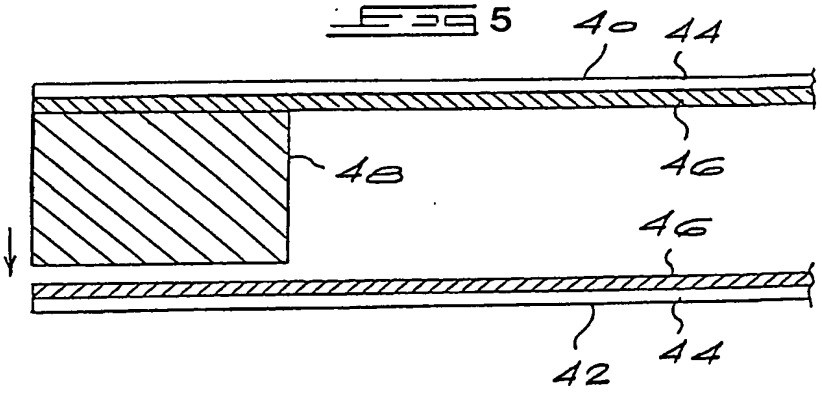
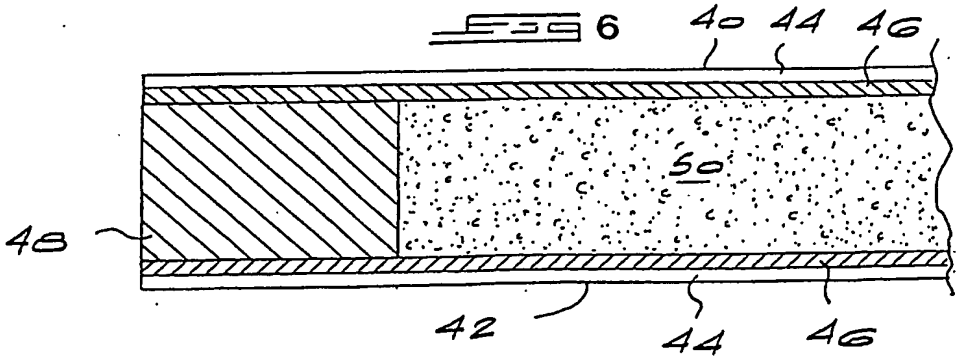


Fig 6



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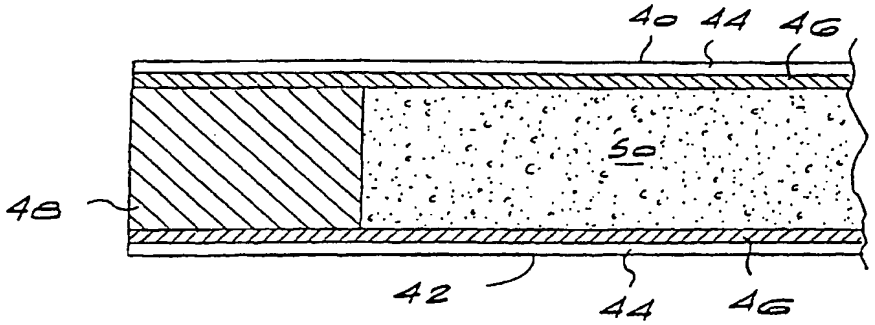
(54) Title: METHOD OF MAKING A COMPOSITE PANEL



(57) Abstract: A method of making a composite panel from two substantially similar panel skins (40, 42) and an edging (48), is disclosed. The first panel skin (40), is made in a mould from a first composition comprising a thermosetting resin, a catalyst for the thermosetting resin and inorganic filler particles. On this layer is placed a layer of a fibrous reinforcing material wetted with a second composition comprising a thermosetting resin and a catalyst for the thermosetting resin. Before the thermosetting resin in the second composition has set, the edging (48) is placed all around the edge of the first panel skin (40). The thermosetting resin in the second composition then sets to form a combination of the first panel skin (40) with the edging (48) attached thereto. The second panel skin (42) is then formed in the same manner as the first panel skin (40) and before the thermosetting resin in the second composition is set, the combination of the first panel skin (40) and the edging (48) is placed on the second panel skin (42) with the edging (48) in contact with the second panel skin (42). The thermosetting resin is then allowed to set to form an intermediate panel from the second panel skin (42) and the combination. The intermediate panel includes a cavity defined by the first and second panel skins (40, 42) separated by the edging (48), and this cavity is filled with a polyurethane foam (50) to form the composite panel.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B29D31/00 B29C70/02 B29C70/08 B29C44/18 B29C44/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B29D B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 198 14 039 A (KOEGEL FAHRZEUGWERKE AG) 7 October 1999 (1999-10-07)	
A	GB 877 615 A (PERCY HENRY ALCOCK) 20 September 1961 (1961-09-20)	
A	US 3 573 144 A (ANDERSEN RALPH A) 30 March 1971 (1971-03-30)	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
22 February 2002	01/03/2002

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19814039 A	07-10-1999	DE 19814039 A1	07-10-1999
		WO 9950060 A1	07-10-1999
GB 877615 A	20-09-1961	NONE	
US 3573144 A	30-03-1971	NONE	